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Difference among Levels of Inquiry: Process Skills Improvement at Senior High School in Indonesia

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The objective of the research concerned here was to discover the difference in effectiveness among Levels 2, 3, and 4 of inquiry learning in improving students' process skills. The research was a quasi-experimental study using the pretest-posttest non-equivalent control group research design. Three sample groups were selected by means of cluster random sampling. They were three SMA (*sekolah menengah atas*, Indonesian senior high school) classes respectively serving as Experimental Group 1 were treated with inquiry learning of Level 3 (ILL-3), Experimental Group 2 were treated with inquiry learning of Level 4 (ILL-4) and Control Group were treated with inquiry learning of Level 2 (ILL-2). The research results indicate that there is significant difference in effectiveness among Levels 2, 3, and 4 of inquiry learning in improving students' process skills. Inquiry learning of Level 3 (ILL-3) is more effective than inquiry learning of Level 2 (ILL-2) and Level 4 (ILL-4) in improving students' process skills, as shown by the gain scores. It, therefore, indicates that, in improving students' process skills, the teacher could apply inquiry learning of the levels that are appropriate for their scientific experience and competence, which are then to be raised to higher levels.

Key Words: inquiry learning, level of inquiry, process skill, senior high school, quasi-experiment

INTRODUCTION

Depdiknas (Departemen Pendidikan Nasional), the department of national education in Indonesia, has stated one of the objectives of physics learning at SMA (*sekolah menengah atas*, Indonesian senior high school) demanding that the students become able to state problems related to physical phenomena, formulate hypotheses, design and perform experiments, conduct careful measurements, record and present the results in

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the form of tables and graphs, draw conclusions, and report the results both orally and in writing (Depdiknas, 2013). In Indonesia, the government has also issued the regulation that makes scientific approach compulsory for each subject taught. The learning using scientific approach not only views learning outcome as final destination but also views the learning process as very important matter. In relation with it, there is a demand for students to be able to possess good process skills. Akinbobola & Afolabi (2014) mention in their research that process skills are included among what support the learning of sciences, which include physics. Abungu (2014) also states that process skills are the centers for procurement of the scientific knowledge that is useful for solving problems in society. Therefore, the development and improvement of students' process skills become matters of importance for the teacher to do for the attainment of learning objectives.

Process skills could be developed through direct experiences as learning experience (Rustaman, 2005). One learning type leaning towards direct experience is inquiry learning. Inquiry learning could provide the instructional work frame that helps to make sure that learners develop broader intellectual scope and scientific process skills (Wenning & Ali Khan, 2011). Ergul et al. (2011) find that the use of inquiry learning methods could significantly improve learners' science-related process skills. Misbah (2012) and Lalu and Asep (2013) also conclude that inquiry learning could improve learners' process skills. In inquiry learning, learners have more personal experience of the process of the scientific quest for knowledge so that it gives them meaningful perception and causes their science process skills to grow.

In implementing inquiry learning, the teacher should possess a certain attitude and competence in encouraging students in order that they succeed in the inquiry-based class. Besides, the teacher should also know that inquiry learning has several levels and any level chosen should be appropriate for the students' level of competence and experience. The reason is that one of the keys to success in inquiry learning is to understand that the skills and responsibilities related to a new level could only be introduced to learners by stages from time to time. By knowing the students' level of competence, the teacher would find it easy to design an accurately constructed learning sequence that enables the students to develop improvement in level of skill and expertise in the learning of science so that the process of inquiry learning could run well. Llewellyn (2011) also states that the existence of several levels of inquiry makes it possible for the teacher to be able to build an investigation with different degrees of guidance so that students have a chance to choose a level appropriate for the developmental stage of their respective learning style.

The particular research concerned here applied several levels of inquiry on students to see which was more appropriate for their competence in improving their process skills. The research questions were as follows:

1. Is there any significant difference in effectiveness among Levels 2 (PIL-2), 3 (PIL-3), and 4 (PIL-4) of inquiry learning in improving the process skills of students of Grade X (the first grade at SMA)?

2. Of Levels 2 (PIL-2), 3 (PIL-3), and 4 (PIL-4) of inquiry learning, which is more effective in improving process skills?

REVIEW OF THE LITERATURE

Science Process Skills

Process skills are physical and mental skills which are related to basic abilities and acquired, mastered, and applied in scientific activities so that scientists manage to find something new (Semiawan, 1989). When learners interact in the world of science, they find their own research through the question, hypothesis, prediction, investigation, interpretation, and communication stages and these are what are called science process skills (Ash, 1998). Shebba (2013) also states that a process skill is a basic ability that one should master in order to be able to understand science. It, therefore, could be said that a process skill is a basic ability for students to use in applying the scientific method needed when conducting a search for knowledge.

Process skills have a role in the process of scientific knowledge formation. Process abilities could influence learners' development, as indicated by some studies that have been made. The development of process skills could support learners' thinking and function as support for other cognitive skills like the skills of logical thinking, reasoning, investigating, and evaluating, support for problem solving ability, and support for creativity (Özgelen, 2012; Abdul Rauf, 2013). Process skills are also important for meaningful learning (Karamustafaoglu, 2011). With process skills, learners could feel direct experience with objects and events that are around them (Osman, 2012). In addition, process skills help learners enter the culture of science, where science learning is a matter of not only receiving but also making efforts to conduct science search activities by using the process skills (Settlage & Sherry, 2012).

Science process skills could be divided into two groups, namely, that of the basic skills and that of the integrated skills. The basic skills consist of the observation, communication, classification, measurement, temporary/tentative/initial conclusion (or inference), and prediction skills. The integrated skills consist of the variable identification, table making, graph making, inter-variable relation description, data elicitation and processing, investigation analysis, hypothesis construction, variable operational definition, and investigation and experiment design skills (Rezba et al. 2007). In the research concerned here, the process skills measured were the observation, hypothesis construction, data interpretation, conclusion drawing, and research result communication or dissemination skills.

Inquiry and Level of Inquiry

Inquiry is a learning process with emphasis on the process of critical thinking and analysis to seek and find by oneself the answer to a problem expressed as a question (Sanjaya, 2008). According to Dostal (2015), inquiry-based learning is a teacher and learner activity focused on knowledge, skill, and attitude development based on the activeness of cognition in learners learning to conduct exploration by themselves. Fang et al. (2010) find that inquiry learning is an activity teaching the learners the use of

scientific knowledge and process as well as the skills of critical thinking and reasoning in formulating and discussing their questions.

Inquiry learning gives opportunity for learners to develop the skills that they will need throughout their life and to learn how to solve problems that might not have clear solutions and how to face changes and challenges that still have to be understood and inquiry learning helps learners seek solutions to problems facing them at present or in the future (*Alberta Learning*, 2004). Learning through inquiry gives learners independence by encouraging them to have a more active and responsible role in various stages of investigation. However, there is still a demand for the teacher to prepare activities enabling students to identify and review secondary information critically. Therefore, the teacher's mastery of inquiry learning becomes an important asset for the accomplishment of inquiry learning in the classroom. It is in line with the research by Olagoke (2014) which concludes that the success of inquiry learning depends on the teacher's knowledge of such learning. In directing the inquiry activities in the classroom, the teacher should know the students' level of experience and the teacher's own level of ease or comfort with the existing level of inquiry so that the inquiry learning could be well accomplished. Most students, regardless of their age, require lengthy training to develop their inquiring ability and their understanding of how to conduct an investigation activity by themselves from beginning to end (Banchi & Bell, 2008). It urges the division of inquiry into several levels.

Some experts have divided inquiry into several levels. Among them are Sutman, Schmuckler & Joyce (2008), who state that there are six levels of inquiry, which differ from one another in the roles of the teacher and the student. The teacher's involvement in the learning conducted would increasingly lessen in accordance with the level of inquiry currently in progress. The higher the level of inquiry, the more active the students in the learning; conversely, the lower the level of inquiry, the greater the role of the teacher in the learning. It could be seen in Table 1, which is about reference for levels of inquiry learning.

Table 1
The Levels of Inquiry Instructional Matrix

<i>Levels of Inquiry</i>	<i>Pre-Laboratory Experience</i>		<i>Laboratory Experience</i>	<i>Post-Laboratory Experience</i>	
	<i>Proposes Problem or issue to be explored</i>	<i>Plans procedure to be used to explore</i>	<i>Carries out procedures, collects and analyses data from observations</i>	<i>Supplies answers or conclusions related to the inquiry</i>	<i>Considers how the discoveries can be applied or can lead to other inquiries</i>
0	Teacher	Teacher	Teacher	Teacher	Teacher
1	Teacher	Teacher	Teacher	Teacher	Students
2	Teacher	Teacher	Teacher	Students	Students
3	Teacher	Teacher	Students	Students	Students
4	Teacher	Students	Students	Students	Students
5	Students	Student	Students	Students	Students

(Sutman, Schmuckler & Joyce, 2008)

The difference in role between the teacher and the student in carrying out learning based on level of inquiry gives an opportunity for the students to be able to adjust their learning experience and knowledge to the learning that they participate in. Students would be able to go along with the learning activity well if the level of inquiry used is made to fit their competence.

METHOD

Research Subject

The specific research concerned here was a quasi-experimental study using the pretest-posttest non-equivalent control group research design (Wiersma, 1986). The population consisted of students of Grade X (first grade of SMA) in the second semester of the academic year 2014/2015. The sample consisted of three classes of the said students selected by using cluster random sampling. The three classes were called respectively Experimental Class 1 (serving as the first experimental group with $N = 25$), Experimental Class 2 (serving as the second experimental group with $N = 24$), and Control Class (serving as the control group with $N = 28$). Students in Experimental Class 1 were treated with inquiry learning of Level 3 (ILL-3), those in Experimental Class 2 were treated with inquiry learning of Level 4 (ILL-4), and those in Control Class were treated with inquiry learning of Level 2 (ILL-2).

Research Instrument

The research data were obtained by means of observation and testing. An essay test was used to know the students' process skills related to lessons about fluid statics before and after treatment. The test consisted of six items with a coefficient of reliability estimated to be 0.72 in value. The process skill aspects put under observation in the research were making observation, formulating hypotheses, interpreting data, drawing conclusions, and communicating them.

Data Analysis

The data obtained through the research instrument were analyzed with the computer software program SPSS 20.0. It was first made sure that the data were distributed normally and homogeneously. By using the mean scores, gain scores were calculated. Further, an ANOVA (Analysis of Variance) test, i.e., the F-test, was used to determine any significant difference among gain scores related to ILL-2, ILL-3, and ILL-4. Any gain score was obtained by using the equation:

$$g = \frac{s_{post} - s_{pre}}{s_{maks} - s_{pre}}$$

in which g is the gain normalized score, s_{post} is the posttest score, s_{pre} is the pretest score. The criteria of gain could be seen in Table 2.

Table 2
Criteria of Gain

Gain	Criteria
$g > 0,7$	High
$0,3 \leq g \geq 0,7$	Middle
$g < 0,3$	Low

After it was found that there was difference in effectiveness among ILL-2, ILL-3, and ILL-4 in improving process skills, the next step was conducting a post hoc test. It was used to know more details concerning the paired groups that were significantly different and those that were not.

FINDINGS

The research was to determine the significance and effectiveness of ILL-2, ILL-3, and ILL-4 in improving science process skills. The measurement of the process skills was done before and after the implementation of ILL-2, ILL-3, and ILL-4.

Problem One

One-way ANOVA was used on the gain scores related to ILL-2, ILL-3, and ILL-4. The analysis of the ANOVA test used indicated that there was significant difference in effectiveness among ILL-2, ILL-3, and ILL-4 (with $\text{Sig} < 0,05$) in improving process skills. The results obtained could be seen in Table 2. Because there was inter-group significant difference, post-hoc follow-up testing was required to know in what way the groups differed. The testing was done by using the Tukey HSD procedure with $\text{Sig.} < 0,05$.

Table 3

Analysis of Variance (ANOVA) of Gain Scores

Process Skills	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10000,611	2	5000,306	15,837	0,000
Within Groups	23364,272	74	315,733		
Total	33364,883	76			

Table 4

Post-Hoc Comparison of the Gain Means for the three Groups

		Dependent Variable: Process Skills						
		(I) 1	(J) 1	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Tukey HSD	ILL 2	ILL 3	-3,96714	4,88933	0,697	-15,6613	7,7270	
	ILL 2	ILL 4	22,47619*	4,94285	0,000	10,6541	34,2983	
	ILL 3	ILL 2	3,96714	4,88933	0,697	-7,7270	15,6613	
	ILL 3	ILL 4	26,44333*	5,07788	0,000	14,2982	38,5884	
	ILL 4	ILL 2	-22,47619*	4,94285	0,000	-34,2983	-10,6541	
	ILL 4	ILL 3	-26,44333*	5,07788	0,000	-38,5884	-14,2982	

*. The mean difference is significant at the 0.05 level.

Table 5 indicates the results of the post-hoc Tukey HSD test as follows: (1) there is no significant difference in effectiveness between ILL-2 and ILL-3 in improving process skills; (2) there is significant difference in effectiveness between ILL-2 and ILL-4 in improving process skills; and (3) there is significant difference in effectiveness between ILL-3 and ILL-4 in improving process skills.

Problem two

Table 5 indicates the improvement in process skills after the application of ILL-2, ILL-3, and ILL-4. It means that inquiry learning is effective in improving process skills though the pretest and posttest mean scores for process skills related to ILL-3 are higher than those for process skills related to ILL-2 and ILL-4. This result is in line with the research by Blessing (2014) which indicates that inquiry is effective for improvement of students' process skills. The reason is that the inquiry process puts emphasis on meaningful learning, in which students participate actively in the learning activity and could conduct a scientific process in defining the concept being learned. Table 5 shows the mean scores of the first experimental group (with ILL-3 as treatment), the second experimental group (with ILL-4 as treatment), and the control group (with ILL-2 as treatment).

Table 5
Comparison of Pretest and Posttest Mean Scores for Process Skills

<i>ILL-2</i>		<i>ILL-3</i>		<i>ILL-4</i>	
Means		Means		Means	
Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
47,42	77,78	42,89	78,44	51,85	69,68

Table 6
The Gain Calculation Result

<i>ILL-2</i>	<i>ILL-3</i>	<i>ILL-4</i>
N-Gain	N-Gain	N-Gain
Process Skills	Process Skills	Process Skills
0,58	0,62	0,35

Table 6 indicates that the process skill gain score of ILL-3 (which is 0.62) is greater than that of ILL-4 (which is 0.58) and that of ILL-2 (which is 0.58) is greater than that of ILL-4 (which is 0.345).

DISCUSSION

There is significant difference among several levels of inquiry, as documented in a research study (Moyer, 212; Agus, 2012). The findings of the research here support the said research study and indicates that with the application of several levels of inquiry on students, the process skills attained also differ. The difference in effectiveness among ILL-2, ILL-3, and ILL-4 occurs because of differences occurring on the roles of the teacher and the students during the learning process, as explained in the following.

First, there is no significant difference in effectiveness between ILL-2 and ILL -3 in improving process skills. In ILL-3, students are directed to be independent in doing the

activities without demonstrations from the teacher, which is a condition unlike that in ILL-2, so that students are more active in building up their knowledge with their own minds.

Second, there is significant difference in effectiveness between ILL-2 and ILL-4 in improving process skills. In ILL-4, students are not yet able to keep up with the learning well because ILL-4 demands that they be independent in doing the activity of making an investigation procedure with little help from the teacher. The students are not yet used to moving into a higher inquiry level from an inquiry level that they are already familiar with.

Third, there is significant difference in effectiveness between ILL-3 and ILL-4 in improving process skills. In ILL-3 and ILL-4, students begin to be used to being independent in conducting an investigation. It gives students meaningful learning but there is a demand for students to be more independent when they are in ILL-4 than when they are in ILL-3. The students could not instantly keep up with ILL-4 because good inquiry learning could only be applied on students in a sequence ordered from the lowest level through to the highest. All this time, the learning applied on students have largely been moving from ILL-2 to ILL-3. In the research, it is also found that ILL-3 is more effective in improving process skills, as could be seen from the gain score being higher than those of ILL-2 and ILL-4. In ILL-3, students could keep up with the learning well enough because the students' science skills and experiences are already appropriate for the instruction in ILL-3.

CONCLUSION

With the research results and discussion above as basis, it could be concluded as follows. First, there is significant difference in effectiveness among inquiry learning of Level 2 (ILL-2), inquiry learning of Level 3 (ILL-3), and inquiry learning of Level 4 (ILL- 4) in improving the process skills of learners of Grade X (i.e., the first grade at SMA). Second, inquiry learning of Level 3 (ILL-3) is more effective than inquiry learning of Level 2 (ILL-2) and inquiry learning of Level 4 (ILL-4) in improving process skills, as seen from gain scores.

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Turkish Abstract

Sorgulamaya Dayalı Öğrenme Düzeyleri Arasındaki Farklılık: Bir Endonezya Lisesinde Süreç Becerilerini Geliştirme

Bu araştırmanın amacı öğrencilerin sorgulamaya dayalı öğrenmede süreç becerilerindeki gelişme düzeyi olan 2, 3 ve 4. seviyeler arasındaki farklılıkların etkisini keşfetmektedir. Çalışma, öntest-sontest eşdeğer olmayan kontrol grubu yarı deneysel araştırma yöntemi ile desenlenmiştir. Rastgele küme örneklemme ile seçilen 3 grup araştırmada kullanılmıştır. 3 SMA (Sekolah Menengah Atas, Endonezya Lisesi) sınıfından 1. deneysel gruba sorgulamaya dayalı öğrenme seviye 3(ILL-3); 2. deneysel gruba sorgulamaya dayalı öğrenme seviye 4 (ILL-4) ve Kontrol Grubuna sorgulamaya dayalı öğrenme seviye 2 (ILL-2) uygulanmıştır. Araştırma sonuçları sorgulamaya dayalı öğrenme seviye 2, 3 ve 4 düzeylerinin etkililiği arasında anlamlı bir farklılık olduğunu göstermiştir. Sorgulamaya dayalı öğrenme seviye 3 (ILL-3) 'ün Sorgulamaya dayalı öğrenme seviye 2 (ILL-2) ve Sorgulamaya dayalı öğrenmeseviye 4 (ILL-4)'ten daha etkili olduğu elde edilen sonuçlardan anlaşılmaktadır.

Anahtar Kelimeler: sorgulamaya dayalı öğrenme, sorgulama düzeyi, süreç becerisi, lise, yarı deneysel

French Abstract**Différence parmi les Niveaux d'Enquête : Amélioration de Compétences de Processus à Lycée en Indonésie**

L'objectif de la recherche concerné là devait découvrir la différence dans l'efficacité parmi des Niveaux 2, 3 et 4 d'enquête apprenant dans l'amélioration des compétences de processus des étudiants. La recherche était une étude quasi-expérimentale utilisant la conception de recherche de groupe témoin non-équivalente pretest-posttest. Trois groupes types ont été choisis au moyen du groupe l'échantillonnage aléatoire. Se nivelle 2, 3 et 4 d'enquête apprenant dans l'amélioration des compétences de processus des étudiants. L'apprentissage d'enquête du Niveau 3 (mal 3) est plus effectif(efficace) que l'apprentissage d'enquête du Niveau 2 (MAL 2). Ils étaient trois SMA (sekolah menengah atas, le lycée indonésien) des classes respectivement le servant du Groupe Expérimental 1 a été traité avec l'apprentissage d'enquête du Niveau 3 (MAL 3), le Groupe Expérimental 2 a été traité avec l'apprentissage d'enquête du Niveau 4 (MAL 4) et le Groupe témoin a été traité avec l'apprentissage d'enquête du Niveau 2 (MAL 2). Les résultats de recherche indiquent qu'il y a la différence significative dans l'efficacité parmi) et le Niveau 4 (mal 4) dans l'amélioration des compétences de processus des étudiants, comme indiqué par le grand nombre de gain.

Mots Clés: l'apprentissage d'enquête, le niveau d'enquête, traite l'habileté(la compétence), le lycée, la quasi-expérience

Arabic Abstract

الفرق بين مستويات التحقيق: عملية تربية بعض المهارات في المدرسة الثانوية العليا في إندونيسيا

وكان الهدف من البحث المعنية هنا لاكتشاف الفرق في الفعالية بين مستويات 2 و 3 و 4 من تحقيق التعلم في تحسين المهارات العملية للطلاب. وجاء هذا البحث دراسة شبه تجريبية باستخدام غير يعادل تصميم البحث القبلي-البعدي المجموعة الضابطة وقد تم اختيار ثلاثة مجموعات العينة عن طريق العينة العشوائية العشوائية. كانوا ثلاثة *SMA sekolah menengah atas* نظام تقييم التكنولوجيا المتقدمة، في المدرسة الثانوية العليا الاندونيسية (الطبقات خدمة التوالي التجريبية 1 عولجوا تحقيق التعلم من المستوى 3 (إساءة 3)، المجموعة التجريبية 2 عولجوا تحقيق التعلم من المستوى 4 (سوء 4)) والمجموعة الضابطة عولجوا تحقيق التعلم من المستوى 2 (سوء 2). وتشير نتائج البحث أن هناك اختلاف كبير في فعالية بين مستويات 2 و 3 و 4 من تحقيق التعلم في تحسين المهارات العملية للطلاب. تحقيق التعلم من المستوى 3 (إساءة 3) هو أكثر فعالية من تحقيق التعلم من المستوى 2 (سوء 2) والمجموعة 4 (سوء 4) في تحسين المهارات العملية لدى الطلاب، كما هو مبين من قبل عشرات مكاسب.

الكلمات الرئيسية: تحقيق التعلم، مستوى التحقيق، المهارات العملية، المدرسة الثانوية العليا، شبه التجربة

German Abstract**Unterschied zwischen den Ebenen der Untersuchung: Prozess Skills Verbesserung an dem Gymnasium in Indonesien**

Ziel der hier untersuchten Forschung war es, den Unterschied in der Wirksamkeit unter den Ebenen 2, 3 und 4 des Untersuchungserlebnisses zu entdecken, um die Prozessfähigkeiten der Schüler zu verbessern. Die Forschung war eine quasi-experimentelle Studie mit dem Pretest-posttest nicht-äquivalenten Kontrollgruppe Forschungsdesign. Drei Stichprobengruppen wurden mittels Cluster-Stichproben ausgewählt. Sie waren drei SMA (Sekolah menengah atas, indonesische Gymnasium) Klassen, die jeweils als experimentelle Gruppe 1 dienen, wurden mit dem Erforderungslernen von Level 3 (ILL-3) behandelt, die experimentelle Gruppe 2 wurde mit dem Erforderungslernen von Level 4 (ILL-4) behandelt. Und Kontrollgruppe wurden mit dem Erforderungslernen von Stufe 2 (ILL-2) behandelt. Die Forschungsergebnisse zeigen, dass es einen signifikanten Unterschied in der Wirksamkeit unter den Ebenen 2, 3 und 4 der Untersuchung Lernen bei der Verbesserung der Prozesse der Schüler Fähigkeiten. Anfrage

Lernen von Level 3 (ILL-3) ist effektiver als forschendes Lernen der Stufe 2 (ILL-2) und 4 (ILL-4) in der Schüler Prozesskenntnisse zu verbessern, wie sie durch die Verstärkung Ergebnissen gezeigt.

Schlüsselwörter: anfrage lernen, niveau der anfrage, prozess geschick, senior high school, quasi-experiment

Malaysian Abstract

Perbezaan antara Tahap Inkuiri: Process Peningkatan Kemahiran di Sekolah Tinggi di Indonesia

Objektif kajian ini adalah untuk mencari perbezaan dalam keberkesanan antara Tahap 2, 3, dan 4 pembelajaran inkuiri dalam meningkatkan proses kemahiran proses. Kajian ini adalah satu kajian kuasi-eksperimen menggunakan kumpulan kawalan reka bentuk penyelidikan ujian pra-ujian pos. Tiga kumpulan sampel telah dipilih melalui persampelan rawak kelompok. Mereka tiga SMA (Menengah sekolah Atas, sekolah menengah Indonesia) kelas masing-masing berkhidmat sebagai Eksperimen Kumpulan 1 telah dirawat dengan pembelajaran siasatan Tahap 3 (ILL-3), Eksperimen Kumpulan 2 telah dirawat dengan pembelajaran pertanyaan Tahap 4 (ILL-4) dan Kumpulan Kawalan telah dirawat dengan pembelajaran siasatan Level 2 (ILL-2). Hasil penyelidikan menunjukkan bahawa terdapat perbezaan yang signifikan dalam keberkesanan antara Tahap 2, 3, dan 4 pembelajaran inkuiri dalam meningkatkan kemahiran proses pelajar. pembelajaran Siasatan Tahap 3 (ILL-3) adalah lebih berkesan daripada pembelajaran inkuiri Tahap 2 (ILL-2) dan Tahap 4 (ILL-4) dalam meningkatkan kemahiran proses pelajar, seperti yang ditunjukkan oleh skor keuntungan.

Kata Kunci: pembelajaran pertanyaan, tahap siasatan, proses kemahiran, sekolah menengah atas, seakan-eksperimen

Russian Abstract

Разница Между Уровнями Расследований: Процесс Навыков Улучшение в Старшей Средней Школе в Индонезии

Целью исследований здесь было выявить разницу в эффективности между уровнями 2, 3 и 4 изучения запросов в совершенствовании навыков процесса обеспокоенности студентов. Исследование было квази-экспериментальным, использующим предтестовые – пост тестовые исследования дизайна неэквивалентной контрольной группы. Три группы выборки были выбраны посредством кластерной случайной выборки. Они были тремя индонезийскими старшими классами средней школы (Sekolah menengah atas, SMA) соответственно служащими в качестве экспериментальной группы 1 были обработаны с запросом обучения Уровня 3 (ILL-3), экспериментальная группа 2 (ILL-2) была обработана с запросом обучения уровня 4 (ILL-4) и контрольная группа были обработаны с запросом обучения уровня 2 (ILL-2). Результаты исследований показывают, что существует значительная разница в эффективности между уровнями 2, 3 и 4 изучения запросов в улучшении навыков процесса студентов. Изучение запросов на Уровне 3 (ILL-3) более эффективно, чем изучение запросов Уровня 2 (ILL-2) и Уровня 4 (ILL-4) в улучшении навыков процесса студентов, как показывают показатели выигрыша.

Ключевые Слова: изучение запросов, уровень запроса, навык процесса, старшая средняя школа, квази-эксперимент